

Microfluidic Devices for Complex Fluid Control

J. Oakey^{C, S}

Metafluidics Inc., Golden, CO, U.S.A.

D.W. Marr

Department Of Chemical Engineering, Colorado School of Mines, Golden, CO, U.S.A.

Many microscale tasks involve the handling and treatment of small quantities of complex fluids such as blood or suspensions of cells or colloidal particles. Such devices would benefit tremendously from improved and miniaturized chip-top sample handling techniques. To fill this void, we have developed a comprehensive microfluidic device platform based upon the strategic placement and movement of single polymer microspheres. These devices are capable of generating and controlling microfluidic flows as well as manipulating individual particles in a suspension. Devices we have successfully fabricated and demonstrated include colloid-based pumps and valves and microscale flow cytometers. All devices are actuated using externally applied fields, including magnetic and electrical fields as well as optical traps and may therefore be readily integrated to form large parallel device arrays or complex multistep analytical systems. To complement these devices we have integrated an optical-based detection and feedback scheme to monitor and automate chip-top processes.